

## **6.5 METAL MINING FACILITIES**

### **6.5.1 Introduction**

The mining of copper has been the primary concern of metal mining facilities in the Pinal AMA. Historically, the methods that have been used to mine copper have been open pit and underground. Due to the depth and grade of ore bodies located in the AMA, this process is no longer commercially feasible. Consequently, mining companies in the AMA are now using an innovative process known as “in situ” or “in-place” mining. This process requires only a fraction of the water needs as compared to conventional mining techniques.

### **6.5.2 Water Use by Metal Mining Facilities**

Currently, metal mining facilities have rights to pump over 8,500 acre-feet per year of groundwater pursuant to Type 1 and Type 2 grandfathered rights and groundwater withdrawal permits. Withdrawals can vary substantially from year to year due to fluctuations in copper market conditions.

Historical water use for metal mining facilities within the AMA has been low, usually constituting the smallest industrial water use subsector. In 1995, just 29.4 acre-feet were used by metal mining facilities.

The two mining companies that currently operate within the Pinal AMA hold multiple water rights. ASARCO has two different facilities: the Santa Cruz Joint Venture, which is an operational research facility for in situ mining; and the Sacaton Unit, which has been closed since the early 1980s. Additionally, ASARCO operates the Silver Bell Mine, which straddles the boundary of the Pinal and Tucson AMAs. Because the mine’s production wells are located within the Tucson AMA, water use at the facility is regulated by that AMA. The new BHP (formerly Magma Copper) mine near Florence, which will utilize in situ methods on a commercial basis, is expected to be fully operational during the third management period.

### **6.5.3 Program Development and Issues**

First Management Plan requirements for metal mining facilities largely reflected mining practices in place at the time the regulations were written. Key requirements for metal mining facilities included:

- Transport tailings at a minimum average density of 40 percent solids by weight
- Reduce leakage from tailings impoundments by compacting tailings up-slope from the free water surface in ponds or by installing interceptor wells
- Manage tailings impoundments to minimize free water surface, maximize water depth, create stilling basins, and recover decant water
- Recover and recycle tailings impoundment water
- Cap abandoned tailings impoundments to minimize water used for dust control
- Comply with monitoring and reporting requirements

The First Management Plan also required that metal mining facilities built after 1985 were to achieve the greatest feasible tailings density, install any new wells so they would intercept tailings seepage, and equip any new tailings facilities with decant towers and interceptor wells to reclaim tailings pond water and intercept seepage. In the First Management Plan, metal mining facilities could apply for alternative conservation programs or temporary stays from conservation requirements.

First Management Plan requirements were modified in the Second Management Plan to require tailings densities of 45 percent for existing metal mining facilities and 50 percent for new facilities. In addition, all facilities were required to prepare long-range conservation plans in which they were to evaluate the

feasibility of using alternative water sources, reducing tailings evaporation, minimizing water use for dust control, and increasing tailings density to 55 percent.

#### **6.5.4 Metal Mining Conservation Program**

While there are currently no facilities within the Pinal AMA engaged in open-pit mining, this mining process is still common within the state. In the event that open-pit or underground mining methods are employed during the third management period, the legal requirements are included within this subsection. (For more information regarding program description of the traditional mining process, refer to the Tucson AMA's Third Management Plan.)

Because in situ mining is the only metal mining process used within the Pinal AMA, the Third Management Plan requirements include the following provisions:

- Long-range conservation plan
- Minimize water use to the extent practicable
- Comply with monitoring and reporting requirements

During the third management period, metal mines will be required to evaluate water conservation practices and technologies that may be implemented at their facility and submit these to the Department in a long-range conservation plan. Conservation plan requirements for new facilities have shifted emphasis from providing site evaluation data to analyzing the latest available conservation technologies consistent with reasonable economic return.

A provision has been added in the Third Management Plan to address possible overlaps or conflicts between water conservation requirements and other environmental regulations. In determining compliance with mine conservation requirements, the director must ensure this compliance does not result in the mines violating other local, state, or federal environmental regulations. Environmental regulations may include Best Available Demonstrated Control Technologies specified by the ADEQ in their mine Aquifer Protection Permit (APP) requirements, mine closure requirements specified in APPs, mine closure requirements specified in the Mine Reclamation Act, air quality standards, federal Clean Water Act provisions, and others.

**6.5.5 Industrial Conservation Requirements and Monitoring and Reporting Requirements for Metal Mining Facilities**

**6-501. *Definitions***

*In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, unless the context otherwise requires, the following words and phrases shall have the following meanings:*

1. *“Abandoned tailings impoundment” means a tailings impoundment that the owner/operator of a metal mining facility does not plan to use for additional disposal of tailings.*
2. *“Alternative water supply” means a water source other than groundwater of drinking water quality.*
3. *“Decant water” means water removed from the stilling basin of a tailings impoundment either by gravity flow into a decant tower or by pumping.*
4. *“Heap and dump leaching” means the extraction of minerals using acid solutions applied to metallic ores which have been removed from their original location and heaped or dumped in a new location.*
5. *“In situ leaching” means the extraction of metallic ores using acid leaching of ores which are not moved from their original natural location.*
6. *“In situ leaching sites” mean those portions of metal mining facilities at which in situ leaching and associated copper recovery operations occur, including surface applications of acid leaching solutions and deep well injection of acid leaching solutions.*
7. *“Large-scale metal mining and processing facility” means an industrial facility at which mining and processing of metallic ores is conducted and which uses or has the potential to use more than 500 acre-feet of water per reporting year. For the purposes of this definition, the annual water use or potential annual water use includes all water from any source, including effluent, used or projected to be used within or by the facility, regardless of the nature of the use.*
8. *“Mill concentrator” means the structure at open-pit metal mines within which metallic ore is crushed and the flotation process is used to remove minerals.*
9. *“Mill circuit” means the flow of water used in the process of crushing ore, recovering copper at the mill concentrator, and transporting and disposing of tailings, and includes recovery of water at the tailings impoundments for reuse in the mill concentrator.*
10. *“Post-1985 metal mining facility” means either:*
  - a. *A large-scale metal mining and processing facility that does not qualify as a pre-1986 metal mining facility, including any expanded or modified portion of the facility; or*
  - b. *Any expanded or modified portion of a pre-1986 metal mining facility if the expansion or modification includes one or more new tailings impoundments, new mill circuits,*

*or new leaching facilities, and was not substantially commenced as of December 31, 1985.*

- 11. "Pre-1986 metal mining facility" means a large-scale metal mining and processing facility at which the mining and processing of metallic ores was occurring as of December 31, 1985 or which was substantially commenced as of December 31, 1985 and includes any expanded or modified portion of such a facility if the expansion or modification includes one or more new tailings impoundments, new mill concentrator circuits, or new wells and was substantially commenced as of December 31, 1985.*
- 12. "Seepage water" means water which has infiltrated from tailings impoundments into the material underlying the tailings impoundments.*
- 13. "Substantially commenced as of December 31, 1985" means, with regard to the construction, expansion, or modification of a large-scale metal mining and processing facility, that the owner or operator of the facility had obtained all pre-construction permits and approvals required by federal, state, or local governments for the construction, expansion, or modification of the facility by December 31, 1985 or had made a substantial capital investment in the physical on-site construction of the project in the 12 months prior to December 31, 1985.*
- 14. "Tailings" mean the slurry of water and fine-grained waste rock material remaining after minerals have been removed in the mill concentrator and excess water has been recovered and returned to the mill concentrator.*
- 15. "Tailings impoundment" means the final disposal site for tailings generated in the milling circuit.*

**6-502. Conservation Requirements for Pre-1986 Metal Mining Facilities**

*Beginning on January 1, 2002 and continuing thereafter until the first compliance date for any substitute conservation requirement in the Fourth Management Plan, an industrial user who uses water at a pre-1986 metal mining facility shall comply with the following requirements:*

**A. Management of Tailings Density**

*The industrial user shall transport tailings to the tailings impoundment area at the maximum density possible consistent with reasonable economic return; but, beginning with calendar year 2002, the average density of the tailings during transport shall be 48 percent solids by weight or greater during the period consisting of the reporting year and the previous two years. The director may reduce the density required for a period of time determined by the director if the industrial user demonstrates that due to the shut down of ore processing or tailings transport equipment or due to the density of ore being mined a three-year average density of 48 percent or greater cannot be achieved.*

**B. Management of Presliming/Interceptor Wells**

*The industrial user shall comply with one of the following:*

1. *Deposit a layer of tailings immediately up-slope from the free water level in each tailings impoundment. The tailings layer shall be 12 inches or more in thickness and shall minimize soil surface permeability.*
2. *Drill interceptor wells down-gradient from each tailings impoundment. The interceptor wells shall be designed, located, and operated in such a manner as to intercept the maximum amount of seepage water possible from each tailings impoundment. Water recovered from the interceptor wells shall be reused at the mining facility.*

**C. Management of Water in Tailings Impoundments**

*The industrial user shall minimize the free water surface area in each tailings impoundment by complying with all of the following:*

1. *Manipulate tailings which have been disposed of in a tailings impoundment and manage new disposal of tailings in an impoundment to create stilling basins that increase the rate of recovery of decant water from the stilling basins and to minimize the free water surface area of stilling basins.*
2. *Use decant towers, barge pumps, or sump pumps to recycle water from each tailings impoundment back to the mill concentrator.*
3. *Expand decant tower barge pumping capacity where necessary to increase the capacity to recycle water from each tailings impoundment back to the mill concentrator.*
4. *Use, to the maximum extent possible, tailings impoundment water rather than pumping additional groundwater.*

**D. Capping Abandoned Tailings Impoundments**

*The industrial user shall cap each abandoned tailings impoundment in a manner which minimizes the quantity of water used for dust control purposes and/or revegetation.*

**E. Heap and Dump Leaching**

*The industrial user shall apply water to heap and dump leaching operations in a manner which minimizes water use to the extent practicable, consistent with reasonable economic return.*

**F. Additional Conservation Measures**

*An industrial user who uses water at a metal mining facility shall comply with three of the following eight conservation measures at those portions of the facility that do not qualify as in situ leaching sites:*

1. *When revegetating abandoned mine-related areas, utilize drought-tolerant vegetation.*
2. *Utilize multiple decant towers in single impoundments to increase decant rate.*
3. *Convert piping to high density polyethylene piping to increase density of transported tailings.*

4. *Harvest and reuse storm water runoff on site.*
5. *Reuse pit dewatering water.*
6. *Reduce evaporation from free-standing water surfaces in addition to evaporation reduction from stilling basins.*
7. *Reduce water used for dust control by reducing the number and extent of haul trips, using road binders, converting to conveyors for material transport, or using another dust control measure which reduces water use.*
8. *Reduce water used for delivery of acid/water solution for heap or dump leaching operations by using delivery methods that use less water than sprinkler delivery.*

**6-503. Conservation Requirements for Post-1985 Metal Mining Facilities**

*Beginning on January 1, 2002 or upon commencement of operations at the facility, whichever is later, and continuing thereafter until the first compliance date for any substitute conservation requirement in the Fourth Management Plan, an industrial user who uses water at a post-1985 metal mining facility shall comply with conservation requirements applicable to pre-1986 metal mining facilities as prescribed in section 6-502, subsections C through F, and the following additional requirements:*

**A. Management of Tailings Impoundments**

*The industrial user shall design and construct any post-1985 tailings impoundments to maximize recovery of water from the stilling basins and to minimize seepage water. Any interceptor wells down gradient of tailings impoundments shall be constructed to maximize recovery of seepage water.*

**B. Management of Tailings Density**

*The industrial user shall design, construct, and operate any post-1985 mill concentrators and their associated tailings transport systems to achieve the maximum tailings densities possible consistent with reasonable economic return, but the average annual density of tailings during transport shall not be less than 50 percent solids by weight.*

**C. Management of In Situ Leaching**

*The industrial user shall utilize water for in situ leaching in a manner which minimizes water use to the extent practicable, consistent with reasonable economic return.*

**6-504. Alternative Conservation Program**

*An industrial user who uses water at a metal mining facility may apply to the director to use conservation technologies other than the technologies prescribed in sections 6-502 and 6-503, whichever is applicable. The director may approve the use of alternative conservation technologies if the director determines that both of the following apply:*

1. *The industrial user has filed a detailed description of the proposed alternative technologies and the water savings that can be achieved by the use of these technologies with the director.*

2. *The industrial user has demonstrated to the satisfaction of the director that the latest commercially available conservation technology consistent with reasonable economic return will be used.*

**6-505. *Modification of Conservation Requirements for Metal Mining Facilities***

- A. *An industrial user who uses water at a metal mining facility may apply to the director to modify conservation requirements prescribed in sections 6-502 and 6-503, whichever is applicable, for any year in which compliance with the conservation requirements would likely result in violation of any federal, state, or local environmental standards or regulations. To apply for a modification of conservation requirements, an industrial user shall submit a request in writing to the director which includes the following information:*
  1. *Documentation describing the conservation requirement(s) for which compliance with this requirement is likely to result in violation of environmental standards and the environmental standards which are likely to be violated.*
  2. *The proposed modification to the conservation requirements.*
- B. *The director shall grant a request for modification of conservation requirements if the director determines that compliance with the conservation requirements prescribed in sections 6-502 and 6-503, whichever is applicable, would likely result in a violation of any federal, state, or local environmental standards or regulations.*

**6-506. *Preparation of a Long-Range Conservation Plan for Metal Mining Facilities***

*By January 1, 2002 or three months prior to commencement of operations at the facility, whichever is later, an industrial user who uses water at a metal mining facility shall submit to the director a long-range water conservation plan which describes the existing or planned design, construction, and operation of the facility, including a description of the ore type, method of mining, and method of metal extraction. The plan shall include an evaluation of the use of the latest commercially available conservation technology consistent with reasonable economic return. Prior to submitting the plan, the industrial user shall analyze the feasibility of applying the following conservation practices or technologies at the mine and shall report the results in the plan:*

1. *Using alternative water sources for mining and metallurgical needs, including determining the source and volume of the alternative water sources being analyzed.*
2. *Reducing tailings impoundment evaporation through the application of the latest commercially available technologies for minimizing evaporation from the impoundments and through the application of improved tailings management.*
3. *Minimizing water use for dust suppression through the use of road binders, conveyors, paved haul roads, and other available dust control mechanisms.*
4. *Increasing tailings densities to 55 percent solids or greater by weight.*

*The industrial user may include any additional conservation techniques or technologies in the plan. The plan shall include a schedule of the approximate dates for implementation of any conservation practices or technologies which the industrial user intends to implement.*

**6-507. Monitoring and Reporting Requirements for Metal Mining Facilities**

**A. Water Measurement and Reporting**

*For calendar year 2002 or the calendar year in which the facility commences operation, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute requirement in the Fourth Management Plan, an industrial user who uses water at a metal mining facility shall include in its annual report required by A.R.S. § 45-632 the following information:*

- 1. The quantity of water from any source, including effluent, used during the calendar year for each of the following purposes: dust control, tailings revegetation, domestic use, and transportation of tailings to tailings impoundments. The quantity of water used for dust control and tailings revegetation shall be separately measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq. The quantity of water used for domestic use and transportation of tailings to tailings impoundments may be estimated.*
- 2. The quantity of make-up water from any source, including effluent, used during the calendar year for each of the following purposes: equipment washing, leaching operations, and milling operations, as separately measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*
- 3. The quantity of water from any source, including effluent, reclaimed during the calendar year from each of the following: tailings impoundments and pit dewatering. These quantities shall be separately measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R-12-15-901, et seq.*
- 4. The tons of ore milled during the calendar year.*
- 5. The tons of ore stacked to heap and/or dump leach during the calendar year.*
- 6. The tons of ore vat leached during the calendar year.*
- 7. The tons of material mined during the calendar year.*
- 8. The tons of mineral produced from mill circuits and from leach circuits during the calendar year.*
- 9. The average gallons of water consumed per ton of mineral produced during the calendar year.*
- 10. The average percentage of solids by weight in tailings transported to the tailings impoundments during the calendar year and in each of the previous two years.*
- 11. The average annual depth of water at the deepest portion of the stilling basin(s).*
- 12. Copies of aerial photos of tailings impoundments, with scale indicated, for use by the Department in determining the wetted surface area of the tailings impoundments.*
- 13. A description of the additional conservation measures applied at the metal mining facility as prescribed in section 6-502, subsection F.*



**B. Contiguous Facilities**

*A single annual report may be filed for a pre-1986 metal mining facility and a post-1985 metal mining facility which are contiguous and owned by the same owner. The combined operations of the metal mining facilities shall be described pursuant to reporting requirements specified in subsection A of this section.*